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ABSTRACT

California State University (CSU) at Chico has been an innovative leader in distance education for many years. In 1969 CSU began offering external degree programs, delivered by faculty who commuted to community college locations around rural northern California. In the early 1970s a study on the needs of higher education in the area resulted in the creation of an extensive Instructional Television Fixed Service (ITFS), which replaced the commuting faculty. ITFS is a one-way video, two-way audio system that currently delivers single courses and entire degree programs to about 550 students at 16 learning sites. It also serves numerous educational groups, state agencies, and corporations. Classes are live broadcasts of regular on-campus sessions. The catalog of CSU's entire library collection is in machine readable format accessible to ITFS students. CSU installed a C-band satellite uplink in 1984 and a Ku-band uplink in 1986. CSU delivers courses leading to a Master's degree in computer science by satellite, with current enrollment of 200 corporate employees in 9 states, and is developing a Bachelor's degree in computer science for satellite delivery. Other CSU satellite telecommunications activities include teacher education courses provided for the TI-IN network through federal Star Schools funding, and both statewide and nationwide teleconferences. Appendices list CSU ITFS programs, the computer science course schedule for 1988-92, and teleconferences produced since 1985. (SV)

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A Rural Campus Reaches Out: Telecommunications at California State University, Chico

January 1989

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Introduction

California State University, Chico has been active in distance learning for a long time. Our extensive ITFS/Microwave system was started in 1975, a C-band uplink was installed on our campus in 1984, and a Ku-band uplink was installed in 1986. California State University, Chico is one of the few institutions in the United States that has both C and Ku-band uplink facilities located directly on our campus. We deliver a variety of courses and programs to not only our northern California service region but also to locations across North America. Noted as the most innovative campus in the 19 campus California State University system in 1984, Chico has continued to improve and expand their offerings.

Historical Background

California State University, Chico, located in rural northern California, 99 miles north of the capital of Sacramento, was established in 1887 as California's second State Normal School. CSU, Chico is the second oldest institution in the 19 campus California State University system. The two other segments of public education in California are the California Community Colleges, with 106 institutions and the University of California, with nine institutions.

A 1984 survey by the journal California Higher Education rated CSU, Chico as the most innovative campus in the 19 campus California State University system [1]. The role of innovative leader did not develop immediately, but was nurtured by a series of partnerships developed over the years and continuing to date.

Capitalizing on its relatively isolated location, in 1975 the University established an extensive ITFS/Microwave telecommunications system for educational purposes. Offering 25 courses each semester, this program has served more than 6000 students in northern California. In addition to ITFS, in 1984 the University also began offering, live via satellite, five courses each semester leading to the M.S. degree in Computer Science. These courses are taken by employees at corporations located throughout the United States.

The ITFS program and the M.S. in Computer Science live via satellite have been well received:

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northern California residents appreciate the opportunity to receive upper-division courses without having to drive to campus, and high-technology professionals throughout the nation appreciate the live and interactive nature of the M.S. degree available via satellite at their work site.

CSU, Chico

The University is a comprehensive institution, with a budget of approximately $75 million a year, offering Bachelor's and Master's degrees in a variety of subjects. There are approximately 14,000 students at the University with 1,800 faculty and staff, and the greater community of Chico has about 64,000 residents.

CSU, Chico has the largest service area of the various campuses: 33,000 square miles of northern California, or approximately 21% of the land mass of California. There is a resident population in this region of 600,000 individuals or 2.1% of the State's population. The question Chico had to address was how to provide quality education to individuals not on campus who wanted an education.

In 1969, the University began offering External Degree programs at Community College locations in northern California. Cycles of courses were offered by faculty driving to these locations and hundreds of degrees were awarded in this manner. This method of sending faculty to various remote locations has now been replaced by the electronic delivery system.

The Center for Regional and Continuing Education is the major outreach organization of the University and works with institutions and individuals throughout the University's service area. This office coordinates all Summer Session, Extension, non-credit programs and professional development workshops for the University.

The Center also coordinates the teleconferencing facilities of the University and Continuing Education works with various department offices to create the cycle of existing on-campus courses delivered throughout northern California via the ITFS/Microwave system. The Center also works with outside organizations, such as the California Commission on Peace Officers Standards and Training, who use the ITFS/Microwave system to deliver cost-effective training to their law-enforcement personnel [2]. Numerous state agencies and educational groups have approached the University to use the telecommunication systems.

The Electronic Delivery System

In the late 1960's and into 1970, a study on the needs of higher education in rural northern California was conducted by the California Coordinating Council of Higher Education. A direct result of this report was the creation of the extensive Instructional Television Fixed Service (ITFS) system throughout northern California.

In 1975, through a variety of funding sources, including system-wide monies and federal dollars from the United States Department of Commerce (NTIA), an ITFS/Microwave link was established between California State University, Chico and the University of California at Davis, 92 miles south of Chico. The link was created to allow the Department of Computer Science at Davis to use Chico Computer Science courses for their developing Ph.D. program in Computer Science.

The initial ITFS/Microwave system has since expanded to 16 sites throughout northern California. At CSU, Chico ITFS stands for Instructional Television For Students. Single courses and entire degree programs are delivered electronically throughout northern California. Currently each semester there are approximately 550 enrollments at the 16 learning sites in northern California.

The most distant ITFS receive site is in a high school in Yreka, 173 miles north of campus. The eastern leg of the system goes 140 miles over the Sierra Nevada into the United States Sierra Army Depot. The eastern link provides courses to employees of the Grass Valley Group (90 miles from campus), and the southwest leg extends 49 miles into a county schools office in Colusa. The University continues to update the offerings over both the ITFS/Microwave system (Appendix I) and the satellite-delivered Computer Science Program (Appendix II).

The success of the University's telecommunication activities was the reason that Chico was rated number one in innovation by a 1984 survey of faculty and administrators of the 19 campus California State University system. The article pointed out that "as communication technology developed, Chico was quick to substitute the airwaves and phone lines for the automobile and rural highway" [3] and "in citing Chico as number one, respondents repeatedly cited the university's instructional television program that serves rural communities throughout northeastern California, its continuing education program and external degree program and computerized library." [4]

The computerized library refers to the fact that the catalog of Chico's entire library collection, over 1,000,000 items, is in machine-readable format and is accessible via computer terminals from anywhere in the world. It is one of the largest retrospective catalogs and it is being used by both ITFS students throughout the region and students enrolled in the M.S. degree in Computer Science throughout the United States.

The ITFS classroom is a state-of-the-art facility and the ITFS courses are regularly scheduled classes, taught by regular faculty to on-campus students. They are concurrently taught via ITFS, and the ITFS student pays the exact same fees as if she or he were attending class live in Chico.

The CSU, Chico ITFS/Microwave System is currently a one-way video, two-way audio system which is live and interactive. CSU, Chico is licensed to operate four channels but currently only one channel is utilized. The ITFS classroom can comfortably seat 24 individuals. In the classroom are four television cameras, two face the front of the class to pick up the instructor, one camera serves as an overhead camera over the instructor's desk, and one camera is at the front of the classroom and is used to televise the on-campus students to the viewers throughout the region. The instructor is outfitted with a wireless microphone and there are microphones in the classroom (one for every two students) so the students in the CSU, Chico class can also interact with the off-campus ITFS student.

The classroom, operated by a single individual in a master control room is in operation from 8AM to 10PM every Monday through Friday and Saturday from 9AM to 3PM. Televised classes are broadcast 2,160 hours a year. CSU, Chico has created 16 additional classrooms throughout the region, (a) without increasing the number of faculty, (b) without constructing 16 rooms, and (c) without the maintenance charges for those 16 classrooms.

The M.S. in Computer Science

After the ITFS system was in place, the University began to look to satellite-delivery of degrees. In 1984 the University installed a 10 meter C-band Scientific Atlanta uplink on campus. At the same time the Hewlett-Packard Company was installing a Ku-band satellite network with the satellite uplink located in Roseville, California. In Fall 1984 CSU, Chico began offering courses leading to the Master's degree in Computer Science, live via satellite, to the Hewlett-Packard Company at their locations in five western states: California, Washington, Oregon, Idaho, and Colorado. At this point the courses were delivered via ITFS/Microwave to the HP site in Roseville and then were uplinked over the HP Ku-

band earth station. In 1986 Hewlett-Packard donated their Roseville uplink to CSU, Chico, and since then the Computer Science courses have been broadcast directly from the campus. Thus, California State University, Chico became one of the few institutions in the United States to own and control both C and Ku-band uplink facilities.

Currently five Computer Science courses are offered live via satellite each semester. Since 1984 Chico's Computer Science Program has grown. Not only has Hewlett-Packard added additional sites, but additional companies have also joined the program. In the Fall 1988 semester almost 200 corporate employees from eight companies (Alcoa, Bently Nevada, China Lake Naval Weapons Center, Grass Valley Group, Hewlett-Packard, IBM, Pacific Bell and Texas Instruments) in nine states (California, Idaho, Nevada, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington) enrolled in and attended these classes at their work site.

A cycle of courses from 1988 to 1992 is now in effect (Appendix II) which enables individuals throughout North America to complete an M.S. degree in Computer Science from CSU, Chico. The Continuing Education Manager for Corporate Engineering at HP points out that technology has allowed them to overcome isolation: "Technology can help compensate for the shortage of engineering and math faculty and can make education accessible to isolated areas. But to maximize these opportunities, careful planning and resource sharing are absolutely necessary." [5]

Bachelor's Degree in Computer Science

One of CSU, Chico's newest developments is the offering of the Bachelor's degree in Computer Science, live via satellite. For some time, various companies have requested that Chico add courses leading to the Bachelor's degree to the Satellite Education Network. With careful planning on this campus, and work with the receiving site, CSU, Chico has now worked out the details for the Bachelor's degree in Computer Science to be delivered live via satellite. It seems very fitting, given Chico's long history in distance education and the use of electronic delivery, that CSU, Chico is the first institution offering a satellite-delivered Bachelor's degree.

Videotaped Courses

In CSU, Chico's continuing effort to provide a broader range of courses live via satellite, the University now offers four of the core courses in the Bachelor's and Master's degrees in Computer Science in videotaped format. Currently, CSCI 171, Computer Architecture, taught by Professor Robert Britton is available. Other courses that will be available over this next year are: CSCI 151, Algorithms and Data Structures; CSCI 152, Operating Systems Programming; and CSCI 172, Systems Architecture. These videotaped courses are self-paced and packaged conveniently for the student.

Star Schools Funding

CSU, Chico is very fortunate to be a partner in one of the four consortia to receive the federally-supported Star Schools funding. The managing partner is the Texas-based TI-IN Network, which has been a leading source of comprehensive educational services to the K-12 network using live, interactive satellite delivery. Over the past several years, CSU, Chico has established a relationship with TI-IN and the potential of this partnership remains high in terms of service to the K-12 network throughout California and the nation.

The federally-supported Star Schools funding has provided a significant grant to TI-IN to improve and enhance its services. With this funding, CSU, Chico is providing University-level credit courses via satellite to TI-IN sites throughout the United States. For the Spring

1989 semester Chico will be broadcasting three graduate level courses aimed at teachers throughout the TI-IN network. In addition, the University will also begin to develop its successful Beginning Teachers program for national delivery

Ad Hoc Teleconferencing

Since 1985, when Chico's C-band satellite antenna became operational, CSU, Chico has received more than 100 teleconferences from throughout the United States. At a minimum these programs have been offered to members of the campus community, and usually we have opened them up to the greater Chico community also.

California State University, Chico has also been very active in producing various teleconferences for audiences from California to throughout the United States (Appendix III). Since 1985 Chico has produced and broadcast from this campus 47 teleconferences. One of the University's first teleconferencing efforts was a program called Consider College, offered on October 8, 1985. This program, aimed at high school and community college guidance personnel, students and parents, dealt with admissions requirements, financial aid processes, considerations regarding housing and special programs for community colleges, the CSU and UC. It was so successful it is updated and offered each fall semester. In order to further encourage high school teachers in the use of satellite-delivered education, the University has sponsored a series of in-service programs over the past couple of years dealing with such areas as The First Year Teacher, Renaissance in the Art of Writing, Mathematics, Geography and many others. Other groups, such as the Area Agency on Aging, the State Department of Education and the State Department of Aging, have also contracted with the University to provide for their teleconferencing needs. This area of ad hoc teleconferencing has grown tremendously over the past few years and this growth is expected to continue as more providers of information see how relatively easy it is to put together programs that can reach all their receive sites at the same time.

Conclusions

The telecommunications activities at California State University, Chico have grown and are continuing to grow. The Fall 1988 semester shows increased enrollments in both the ITFS program and also in the Satellite Education Network. Learning via the electronic medium has become both accepted and acceptable not only in the academic community but also by the students involved. Using telecommunications to provide easy access to education is efficient and and cost effective. In a society that is becoming increasingly more complex, this kind of solution to an educational need is not only important but necessary if we are going to continue to offer affordable (in time and money) educational opportunities to those people in need of them.

Chico's long-term involvement with ad hoc teleconferences, ITFS in northern California, the live and interactive satellite-delivered degree programs in Computer Science, and the recent programs developed for the TI-IN network through STAR Schools funding, combined with computerized library support, is a clear indication of the University's long-range planning and commitment to higher education, utilizing all of the available technologies. Interested readers are invited to contact us for any additional information.

Appendix I

ITFS Programs at CSU, Chico

1. California Studies Minor
2. Collective Bargaining Minor
3. Family Relations Minor

4. GAIN Certificate
5. Paralegal Certificate
6. Planning and Development Minor
7. Political Science Minor
8. Psychology Minor
9. Sociology Minor
10. Tourism Minor
11. B.A. in Liberal Studies
12. B.A. in Social Science
13. B.A. in Sociology

Appendix II

CSCI Course Schedule 1988-92

Fall 1988

CSCI 151,	Algorithms and Data Structures
CSCI 231,	Computer Graphics
CSCI 278,	Computer Networks
CSCI 350A,	Language Theory
CSCI 397C-1,	Seminar in Advanced Topics: Security & Privacy

Spring 1989

CSCI 223,	Artificial Intelligence
CSCI 273M,	Data Base Management
CSCI 298C,	Seminar in Advanced Topics: Computer Performance Analysis
CSCI 356,	Design and Analysis of Algo rithms
CSCI 397C-2,	Seminar in Advanced Topics: Object-oriented Programming

Fall 1989

CSCI 227,	Discrete Simulation Systems
CSCI 251,	Advanced Software Practices
CSCI 350B,	Language Theory
CSCI 371,	System Design Techniques
CSCI 397C-4,	Seminar in Advanced Topics

Spring 1990

CSCI 256,	Theory of Computing
CSCI 272,	Multi-User Operating Systems
CSCI 312,	Software Analysis and Testing
CSCI 377,	Automated Information Retrieval
CSCI 397C-3,	Seminar in Advanced Computer Graphics

Fall 1990

CSCI 278,	Computer Networks
CSCI 273M,	Data Base Management
CSCI 210,	Software Engineering
CSCI 372,	Operating System Theory
CSCI 397C-5,	Seminar in Advanced Topics

Spring 1991

CSCI 222,	Expert Systems and Applications
CSCI 231,	Computer Graphics
CSCI 311,	Software Design
CSCI 320A,	Digital and Analog Transform Theory
CSCI 382A,	Information Theory

Fall 1991

CSCI 250,	Compiler Theory
CSCI 285,	Microprocessor Components and Systems
CSCI 356,	Design and Analysis of Algorithms
CSCI 350A,	Language Theory
CSCI 380,	Digital System Design

Spring 1992

CSCI 223,	Artificial Intelligence
CSCI 310,	Software Metrics and Control
CSCI 376,	Theory of Information Retrieval
CSCI 323,	Theory of Artificial Intelligence
CSCI 397C-6,	Seminar in Advanced Topics

Appendix III

Teleconferences Produced By California State University, Chico

Date	*Title*
Oct 8, 1985	Consider College '85
Jan 15, 1986	In-service: Curriculum Standards
Jan 31, 1986	In-service: Teleconference with David Berliner
Oct 6, 1986	Consider College '86
Dec 5, 1986	Canadian Studies Teleconference
Jan 12, 1987	In-service: First Year Teacher
Feb 23, 1987	In-service: Renaissance in the Art of Writing
Feb 26, 1987	Area Agency on Aging-Nutrition (Food Fads)
Mar 12, 1987	Area Agency on Aging-Nutrition (Outreach & Home Assessments)
Mar 19, 1987	In-service: Teleconference with Lee Shulman
Mar 23, 1987	In-service: Tuning in the Geographic Network
Mar 26, 1987	Area Agency on Aging-Nutrition (Quality Control in Home Delivered Meals)
Apr 9, 1987	Area Agency on Aging-Nutrition (Low Cost Cooking for One and Two)
Apr 23, 1987	Area Agency on Aging-Nutrition (Nutrition Services & Long-term Care)
Apr 27, 1987	In-service: Mathematics
May 5, 1987	In-service: Teleconference with David Hon
May 11, 1987	In-service: Administrative Training
May 14, 1987	Area Agency on Aging-Nutrition (Program Donations & Fund Raising)
May 28, 1987	Area Agency on Aging-Nutrition (Quantity Cooking/ Special Diets/Ethnic Menus)
Jun 11, 1987	Area Agency on Aging-Nutrition (Eating for Your Health)
Jun 25, 1987	Area Agency on Aging-Nutrition (Innovative Nutrition Programs)
Sep 28, 1987	Consider College '87
Nov 18, 1987	In-service: The World at Five Billion
Jan 12, 1988	In-service: Student Retention (Tinto)
Jan 20, 1988	In-service: Neighbors on the Pacific Rim
Feb 10, 1988	Employee Assistance Program-Surviving & Thriving on Campus: Burnout & Boredom
Mar 9, 1988	Employee Assistance Program-Surviving & Thriving on Campus: Stress Management
Mar 23, 1988	In-service: Geography Across the Curriculum
Mar 24, 1988	State Dept. of Education Teleconference: Disability Awareness #1
Apr 13, 1988	Employee AssistanecProgram-Surviving & Thriving on Campus: Financial Planning
Apr 22, 1988	State Dept. of Aging: Survival Skills
May 10, 1988	Emerging Technologies
May 11, 1988	Employee Assistance Program-Surviving & Thriving on Campus: Health Care
May 19, 1988	State Dept. of Education Teleconference: Disability Awareness #3
May 20, 1988	State Dept. of Aging: Relocation Trauma
May 25, 1988	In-service: Cycles and Seasons
Jun 24, 1988	State Dept. of Aging: Brain/ Myths/ Realities

Jul	*22, 1988*	StateDept. of Aging: Drugs and the Elderly
Aug	*19, 1988*	State Dept. of Aging: Nutrition
Sep	*23, 1988*	State Dept. of Aging: Exercise
Sep	*26, 1988*	Consider College '88
Oct	*21, 1988*	State Dept. of Aging: Interpersonal Skills
Nov	*14, 1988*	Food Irradiation

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